

NORMAL THROUGH OPTICAL PANEL

Field of the Invention

The present invention relates to fiber optic connection panels.

5 **Background of the Invention**

Fiber optic connection panels are known which connect various pieces of fiber optic equipment. The fiber optic connection panels include ports for connecting to fiber optic cables, to link the equipment. Various functions are useful in the fiber optic connection panels. One function is monitoring of the signal pathways. Another useful
10 function is switching between equipment if a need arises without having to reconnect the equipment cables. Improvements are desired.

Summary of the Invention

The present invention provides a fiber optic connection panel with a normal through configuration to link optical equipment. Preferably, the panel has
15 monitor access. The panel can preferably be reconfigured to change the circuit pathways, when desired.

The present invention relates to a fiber optic connection panel including a plurality of circuits. The circuits are accessed through termination locations or ports. Preferably, IN and OUT termination locations are located on a first side of the panel
20 during a normal through state. A switch included in the circuitry disconnects the IN and OUT termination locations, and connects each of the IN and OUT termination locations to further IN and OUT termination locations or ports, located on an opposite side of the panel in a patched state. Preferably, at least one of the circuit paths includes a monitor circuit and a termination location or port.

25 In one preferred embodiment, a chassis is provided including a plurality of circuit modules mounted to the chassis, wherein the circuit modules contain circuitry with exposed termination locations where the circuitry allows normal through and patched circuit paths selectively linking different termination locations.

Brief Description of the Drawings

FIG. 1 is a front elevational view of a fiber optic connection panel in accordance with the present invention.

FIG. 2 is a front elevational view of the connection panel of FIG. 1 with
5 the front cover removed.

FIG. 3 is a rear elevational view of the connection panel of FIG. 1.

FIG. 4 is a rear elevational view of the connection panel of FIG. 1 with the rear cover removed.

FIG. 5 is a right side elevational view of the connection panel of FIG. 1.

FIG. 6 is a front perspective view of the connection panel of FIG. 1 with
10 the front cover in the pivoted open position.

FIG. 7 is a rear perspective view of the connection panel of FIG. 1 with the rear cover in the pivoted open position.

FIG. 8 is an exploded front perspective view of the connection panel of
15 FIG. 1.

FIG. 9 is an exploded rear perspective view of the connection panel of FIG. 1.

FIG. 10 is a further exploded front perspective view of the connection panel of FIG. 1.

FIG. 11 is a front perspective view of a circuit module from the
20 connection panel of FIG. 1.

FIG. 12 is a rear perspective view of the circuit module of FIG. 11.

FIG. 13 is a front elevational view of the circuit module of FIG. 11.

FIG. 14 is a rear elevational view of the circuit module of FIG. 11.

FIG. 15 is a side elevational view of the circuit module of FIG. 11 with
25 one side panel removed.

FIG. 16 is a circuit schematic for a portion of the circuitry within the circuit module of FIG. 11.

FIG. 17 is a schematic showing the normal through signal pathway
30 through one of the circuits in the circuit module of FIG. 11.

FIG. 18 is a schematic showing the patched signal pathway through one of the circuits in the circuit module of FIG. 11.

FIG. 19 is another schematic showing the normal through signal pathways through the circuit module.

5 FIG. 20 is a schematic like FIG. 19 showing the patched signal pathways through the circuit module.

FIG. 21 is an exploded perspective view of an alternative embodiment of a connection panel including splices.

Detailed Description of the Preferred Embodiment

10 Referring now to FIGS. 1-10, a fiber optic communications panel 10 is shown. Panel 10 includes a chassis 12 with brackets 14 for mounting panel 10 to a rack, frame, cabinet, or other structure. Panel 10 includes circuitry which connects fiber optic cables and equipment. The circuitry includes a normal through state, and also a patched state for use in changing the connections between the equipment. The preferred
15 circuitry also includes monitor functions for monitoring signals through panel 10.

Panel 10 includes a front 16, and an opposite rear 18. A top 20, an opposite bottom 22, a left side 24, and a right side 26 cooperate with front and back 16, 18 to define an interior 28 for holding the circuitry. Disposed within interior 28 is a bulkhead 32 which holds a plurality of circuit modules 34 containing the circuitry.

20 Panel 10 includes a pivoting front cover 36, and a pivoting rear cover 38 for allowing selective access to interior 28 through front 16 or back 18, respectively. Front and rear covers 36, 38 include hinges 46, and latches 48 for selectively latching covers 36, 38 in the closed positions.

Panel 10 includes a front cable management arrangement 42 disposed
25 between bulkhead 32 and front 16. Behind bulkhead 32, and modules 34, panel 10 includes a rear cable management arrangement 44. Both front and rear cable management arrangements 42, 44 are configured for managing cables extending to and from modules 34. Front cable management arrangement 42 includes a plurality of front

cable rings 50. Cables extending to the fronts of modules 34 are managed by rings 50 and exit chassis 12 at openings 60 defined by the ends of front cover 36.

Rear cable management arrangement 44 includes a plurality of rear cable rings 54. Cable rings 54 are used for slack storage of cables extending into chassis 12
5 toward modules 34.

Rear vertical radius limiters 52 define rear openings 58 for cables entering and exiting panel 10. Fan out mounts 56 are also provided in rear cable management arrangement 44 for use in fanning out ribbon cables. Alternatively, rear cable management arrangement 44 includes splice trays for holding cable splices. FIG.
10 21 shows an alternative panel 200 including a splice tray 202.

Referring now to FIGS. 10-15, one of modules 34 is shown including a module housing 62 including a first side 64, a second side 66, a third side 68, and a fourth side 70. A front face 72, and an opposite rear face 74 cooperate with sides 64, 66, 68, 70 to define an interior 75 for holding circuit elements. Front face 72 includes
15 opposed flanges 76 for mounting to bulkhead 32 with fasteners 78.

Rear face 74 of module 34 includes a plurality of termination locations or ports 80 for accessing the fiber optic circuitry contained within module housing 62. Preferably each termination location 80 includes a fiber optic adapter 82. The illustrated adapters 82 are SC type adapters. Each termination location in panel 10
20 defines a port for connecting to a fiber optic cable. A first port 84 defines a first IN port or input port. A second port 86 defines an OUT port or output port. Rear face 74 further includes a second IN port 88 and a second OUT port 90. Rear face 74 also includes a power connector 92. In normal operation, in the normal through state, port 84 is connected to port 86 and port 88 is connected to port 90.

25 Front face 72 of module housing 62 includes a first IN port 94, and a first OUT port 96. Front face 72 further includes a second IN port 98, and a second OUT port 100. In the normal through operation, front ports 94, 96, 98, 100 are not connected to rear ports 84, 86, 88, 90. In the patched operation, front port 94 is connected to rear port 86. Further, front port 96 is connected to rear port 84, front port 98 is connected to

rear port 90, and front port 100 is connected to rear port 88. Front face 72 further includes two monitor ports 102, 104 for connecting to rear ports 86, 90, respectively.

Switches 106, 108 on front face 72 control switching between the normal through and the patched configurations. First and second visual indicators 110, 112
5 indicate which state the switch is in. Switches 106, 108 are manually operated toggle switches. Other manually operated switches could be used, such as push buttons. Visual indicators 110, 112 are electrically powered LED's in the illustrated embodiment. The indicators are optional, since the position of the toggle switches 106, 108 can also indicate the state of the switching circuit.

10 Referring now to FIG. 15, interior 75 of module 34 includes a printed circuit board 114 including fiber to PC connectors 116 and circuitry 118. The fiber to PC connectors 116 link ports 82, 84, 86, 88, 90, 94, 96, 98, 100 to PCB 114. Circuitry 118 controls operation of the circuit conditions between the normal through state and the patched state. Circuitry 118 (see FIG. 16) includes a power conversion circuit 122
15 for converting minus 48 VDC to plus 5 volts for operating a 2 x 2 optical switch 124. Each toggle switch 106, 108 switches the respective optical switch 124 between states. LED's 110, 112 indicate to the operator the state of the 2 x 2 switch 124. The monitor function is carried out by a splitter 126, such as a 90/10 splitter.

With circuitry 118, each module 34 can provide a transmit signal
20 pathway and a receive signal pathway. Two modules 34 can be cross-connected together to cross-connect two pieces of equipment.

Module 34 includes two circuits, each with two input ports and two output ports in the normal through state and in the patched state. Module 34 can also be packaged each with a single circuit, if desired. By packaging two circuits in one
25 module, a single 2 x 2 optical switch can be used to control the circuit states. In single circuit modules, a 1 x 2 switch would be needed for each module. With the dual circuit module, less switches are needed for the overall system.

While the illustrated embodiment of FIGS. 1-20 uses adapters 82 on rear face 74 of module 34, module 34 can be provided with pigtails which extend out from
30 the interior of the module through an opening 204 in the module and connect to fiber

optic cables, such as through a splice in a splice tray of the panel 200 (see FIG. 21).
Splice trays 202 can be used in rear cable management arrangement 44, instead of the
noted cable clips and fan out mounts as shown in FIG. 21.

The above specification, examples and data provide a complete
5 description of the manufacture and use of the composition of the invention. Since many
embodiments of the invention can be made without departing from the spirit and scope
of the invention, the invention resides in the claims hereinafter appended.